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ABSTRACT

The author presents both optimistic and pessimistic news about the future use of technicians in management and supervisory positions. He is optimistic because of the efforts by industry and education to solve difficulty personnel problems; pessimistic because of the complexity of the organizational structure necessary to manage technical operations today. Included are general information related to the topic and a model of the engineering personnel spectrum. The model shows the pure scientist to be at one end of a spectrum and the craftsman at the other. Other models are described and discussed. The author states that two other variables, administrative theory and administrative art, must be considered if technicians are to be accepted in management roles. (Author/EB)

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April 5-6, 1973
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"INDUSTRY'S FUTURE ACCEPTANCE OF TECHNOLOGISTS AND TECHNICIANS FOR MANAGEMENT POSITIONS"

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SE 020 336

INTRODUCTION

IT IS A PLEASURE TO DISCUSS WITH YOU THE CHOSEN TOPIC "INDUSTRY'S FUTURE ACCEPTANCE OF TECHNOLOGISTS AND TECHNICIANS FOR MANAGEMENT POSITIONS".

I AM BOTH OPTIMISTIC AND PESSIMISTIC ABOUT THE FUTURE USE OF TECHNICIANS IN MANAGEMENT AND SUPERVISORY POSITIONS. OPTIMISTIC BECAUSE OF EFFORTS BY INDUSTRY AND EDUCATION TO SOLVE DIFFICULT PERSONNEL PROBLEMS; PESSIMISTIC BECAUSE OF THE COMPLEXITY OF ORGANIZATIONAL STRUCTURE NECESSARY TO MANAGE TECHNICAL OPERATIONS TODAY.

I UNDERSTAND THAT EACH PANELIST HAS ONLY 10 TO 15 MINUTES TO EXPRESS SOME BACKGROUND ON THIS TOPIC. WHAT I WOULD LIKE TO DO IS RAPIDLY GO THROUGH SOME GENERAL INFORMATION ON THIS TOPIC AND THEN DEFINE ONE MODEL OF THE ENGINEERING PERSONNEL SPECTRUM.

ONE OF OUR PRESENT PROBLEMS IS ONE OF DEFINITION. ALSO IT IS DIFFICULT TO TALK ABOUT MANAGEMENT IN A MACRO SENSE SINCE EACH COMPANY HAS ITS OWN SPECIFIC OBJECTIVES, POLICIES AND PROCEDURES. WHAT I HAVE TO PRESENT SHOULD BE TAKEN IN A CONCEPTUAL SENSE RATHER THAN A SPECIFIC APPLICATION TO ANY GIVEN SITUATION.

THE USE OF TREND ANALYSIS IN PREDICTION OF INDUSTRY'S ACCEPTANCE OF THE ENGINEERING TECHNICIAN IS OF SOME VALUE. I HAVE BEEN AT FLORISSANT VALLEY COMMUNITY COLLEGE SINCE 1964. WE STARTED ENGINEERING TECHNOLOGY (ET) PROGRAMS AT THAT TIME WITH LESS THAN IMMEDIATE SUCCESS. THE MIDWEST HAS BEEN SLOW TO ACCEPT THIS GRADUATE. THE SITUATION IS

SOMEWHAT DIFFERENT TODAY. THERE HAS BEEN A VERY SLOW BUT CONTINUING INCREASE IN USE OF THE ET TO THE POINT THAT NOW THE DEMAND EXCEEDS OUR GRADUATE OUTPUT.

PERHAPS A LOOK AT A MODEL OF THE ENGINEERING PERSONNEL SPECTRUM WILL ALLOW FURTHER PREDICTION.

MANAGEMENT & SUPERVISION

I BELIEVE THAT MUCH OF THE CONFUSION TODAY ABOUT THE ROLES OF THE SCIENTIST, ENGINEERING SCIENTIST, ENGINEERING TECHNICIAN, AND INDUSTRIAL TECHNICIAN HAS COME ABOUT DUE TO AN ATTEMPT TO IDENTIFY THE ADMINISTRATIVE FUNCTION WITH TECHNICAL ACTIVITY. THE TASK OF THE MANAGER OR SUPERVISOR IS TO GET THE JOB DONE BY DIRECTING AND COORDINATING THE EFFORTS OF OTHERS.

THE MAGNITUDE OF THIS TASK HAS INCREASED DUE TO A RAPID EXPANSION IN TECHNOLOGY (FIGURE 1). IN THE AIRCRAFT INDUSTRY WHERE THE WRIGHT BROTHERS WERE ABLE TO SPAN THE ACTIVITY OF SCIENTIST TO CRAFTSMAN (INDEED THEY ALSO FUNCTIONED AS OPERATIVES). IT NOW REQUIRES HUNDREDS OF DIFFERENT TYPES OF INDIVIDUALS. NOT ONLY DO WE NOW HAVE THE PROBLEM OF TRYING TO IDENTIFY ALL OF THESE TYPES, BUT WE HAVE CREATED A HUGE PROBLEM OF MANAGING THE REQUIRED TEAM EFFORT.

ENGINEERING PERSONNEL SPECTRUM

WHILE MANY VARIABLES CAN BE IDENTIFIED TO DESCRIBE VARIOUS JOBS IN THIS COMPLEX SPECTRUM, THE TWO MOST COMMONLY USED TO IDENTIFY THE SCIENTIST, ENGINEERING SCIENTIST, ENGINEERING TECHNICIAN, INDUSTRIAL TECHNICIAN AND CRAFTSMAN ARE THE THEORY AND SKILL (FIGURE 2). THE PURE SCIENTIST WOULD BE AT ONE END OF THE SPECTRUM, THE CRAFTSMAN ON THE OTHER.

THIS CLASSIC MODEL (FIGURE 3) (A. E. PETERSON 1965) SHOWS NOT ONLY THE RANGE OF THEORY AND ART USED BUT ALSO THE RELATIVE MIX OF THE TWO. IT DOES A GOOD JOB OF EXPLAINING THE DIFFERENCE BETWEEN ENGINEERING SCIENCE (ES), ENGINEERING TECHNOLOGY (ET), & INDUSTRIAL TECHNOLOGY (IT) (COMBINATIONS OF THE PSYCOMOTOR AND COGNITIVE DOMAINS).

WHAT IS WRONG WITH THIS MODEL?

1. THE MODEL DOES NOT REPRESENT VARIATIONS OF ACTIVITIES OR USE OF THE THEORY AND SKILL MIX. WITHIN PROFESSIONAL ENGINEERING (OR ENGINEERING SCIENCE) WE HAVE GRADES OF THE EIT AND THE PE. WITHIN ENGINEERING TECHNOLOGY WE NOW HAVE CET GRADES OF AET, ET AND SET. THERE ARE ALSO GRADES WITHIN THE CRAFTS: THE APPRENTICE, JOURNEYMAN, AND MASTER. ALL OF THESE ALLOW UPWARD MOBILITY WITHIN THEIR FORM OF ACTIVITY.
2. THE MODEL TENDS TO REPRESENT THE THEORIST AS THE SUPERIOR CITIZEN AND THE CRAFTSMAN AS A SUBSTANDARD CITIZEN.

3. THE MODEL SUGGEST THE ONLY UPWARD MOBILITY AS A LATERAL ONE (START AS A CRAFTSMAN AND WORK UP TO A SCIENTIST).

FIGURE 4 PROVIDES A GRAPHICAL REPRESENTATION OF A MODEL THAT REMOVES SOME OF THESE DEFICIENCIES. IT WAS DEVELOPED TO REPRESENT THE ENGINEERING SPECTRUM MORE ACCURATELY. THE MORE REALISTIC SITUATION OF UPWARD MOBILITY WITHIN CAREER AREAS CAN BE REPRESENTED. UPWARD MOBILITY CAN BE ACCOMPLISHED BY INCREASING SCIENTIFIC OR ARTISTIC ABILITY OR BOTH.

THIS MAPPING OF FIGURE 5 ALLOWS US TO REPRESENT THE POSITION OF THE EIT AND PE. THE AET, ET, AND SET AS DEFINED BY ICET CAN ALSO BE LOCATED. THIS REPRESENTATION WOULD ALSO INDICATE THAT AN APPRENTICE PLUMBER WOULD INCREASE HIS LEVEL BY MOVING TO JOURNEYMAN THEN TO MASTER PLUMBER STATUS. FIGURE 5 ALSO INDICATES THE AREA COVERED BY THE INDUSTRIAL TECHNICIAN. FIGURES 6, 7, AND 8 SHOW AREAS OF THE SPECTRUM AND THE OVERLAPPING THAT OCCURS.

THE STORY OF THE DEVELOPMENT OF AN ORGANIZED FIELD OF ENGINEERING TECHNOLOGY STARTED BY THE OPENING STATEMENT OF THE 1928-1929 STUDY OF TECHNICAL INSTITUTES REPORT SPONSORED BY THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION (NOW THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION).

"A NEED EXISTS IN OUR POST-SECONDARY SCHEME OF EDUCATION FOR A LARGE NUMBER OF TECHNICAL SCHOOLS GIVING A MORE INTENSIVE AND PRACTICAL TRAINING THAN THAT NOW PROVIDED BY THE ENGINEERING COLLEGES"

HENNINGER

ANOTHER STUDY WAS MADE IN 1957-1958 AND WAS REPORTED BY ITS DIRECTOR G. ROSS HENNINGER IN 1959. FOR THE PURPOSES OF THIS STUDY COMMITTEE FORMULATED A DEFINITION OF THE ENGINEERING TECHNICIAN THAT WAS WIDELY DISTRIBUTED AND FORMED THE BASIS OF OUR DEFINITION OF ET TODAY.

THE NATURE OF THE THEORY-SKILL PLANE REPRESENTING DISCIPLINARY AREAS DIFFER. THE LOCATION OF ET ON EACH PLANE WILL DIFFER AND A NUMBER OF PLANES WILL BE REQUIRED TO MORE ACCURATELY DESCRIBE THE TECHNICAL PERSONNEL SPECTRUM (FIGURE 9).

FIGURE 10 SHOWS WHAT THE TECHNICAL PERSONNEL DEMAND MAP FOR A RESEARCH ORIENTATED FIRM MIGHT LOOK LIKE AND FIGURE 11 MIGHT REPRESENT THE DEMAND MAP FOR A PRODUCTION ORIENTATED FIRM.

THE ADDED DIMENSIONS

WHAT DOES THIS HAVE TO DO WITH THE ACCEPTANCE OF TECHNICIANS IN MANAGEMENT ROLES? IF WE ARE TO TALK ABOUT

THIS WE WILL HAVE TO ADD TWO MORE VARIABLES: ADMINISTRATIVE THEORY & ADMINISTRATIVE ART. I WOULD HYPOTHESIZE THAT THERE IS LITTLE OR NO CORRELATION BETWEEN THE ADMINISTRATIVE AND TECHNOLOGICAL VARIABLES. PERHAPS THE CORRELATION BETWEEN THE ADMINISTRATIVE AND TECHNOLOGICAL VARIABLES. PERHAPS THE CORRELATION MAY BE NEGATIVE (CASE OF THE BEST MACHINE OPERATOR MADE FOREMAN RESULTING IN THE LOSS OF A GOOD CRAFTSMAN WITH A LESS THAN ADEQUATE FOREMAN).

THE ENGINEERING TECHNICIAN MAY BE THE BEST POSITION TO MOVE INTO MANAGEMENT BECAUSE OF HIS MIDDLE LOCATION IN THE TECHNOLOGICAL PERSONNEL SPECTRUM. WHOEVER MOVES THIS WAY, HOWEVER, MUST REALIZE THAT HE IS MOVING OFF THE TECHNOLOGICAL SPECTRUM MAP. THE THEORY & ART OF MANAGEMENT MUST BE MASTERED AND THE ACCEPTANCE OF THOSE MANAGED GAINED. I PERSONNALLY FEEL THAT WE WILL SEE MORE AND MORE ETS PURSUE ADMINISTRATIVE STUDY BOTH ON THE JOB AND IN FURTHER EDUCATION. INDUSTRY WILL ACCEPT THOSE ETS WHO SHOW PROMISE IN SUPERVISING TECHNOLOGICAL ACTIVITY.

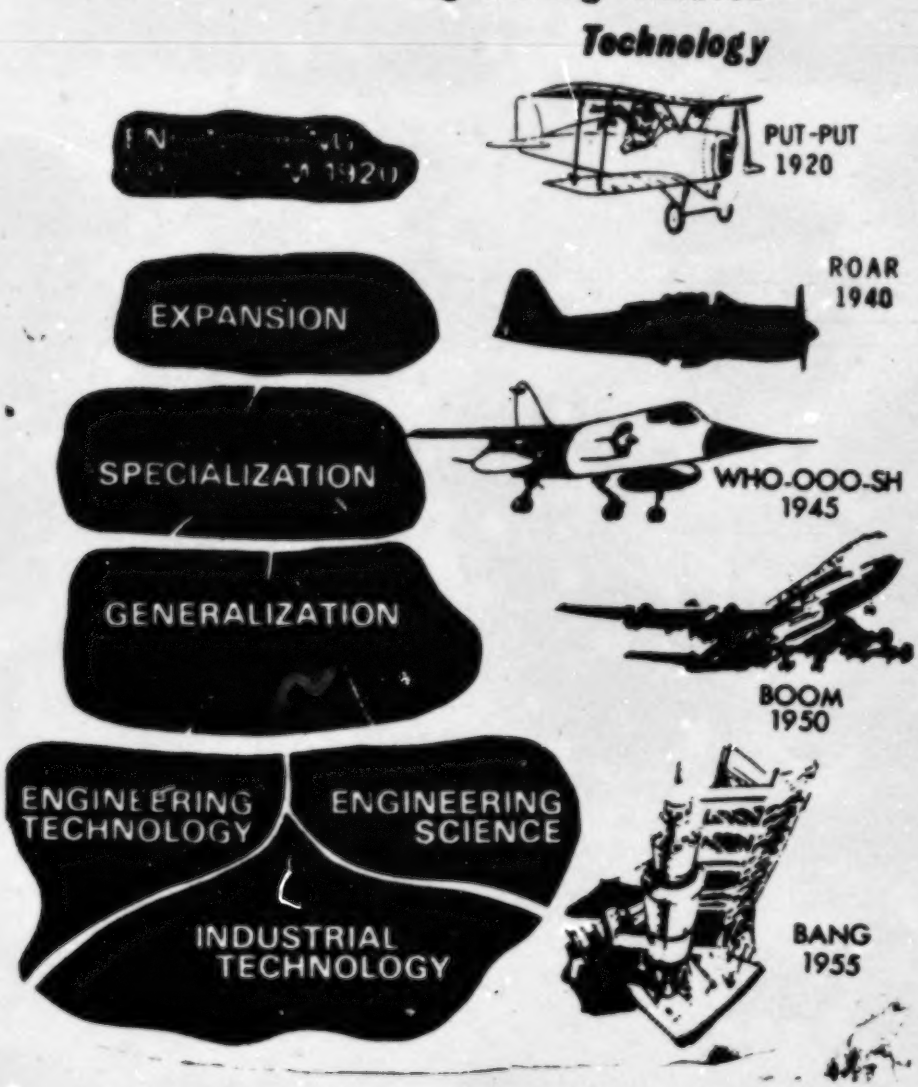

Figure 1

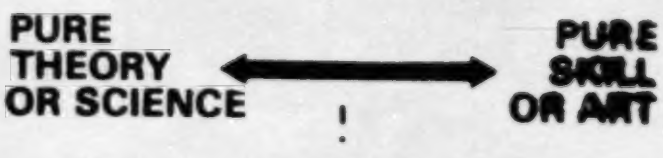

Figure 2

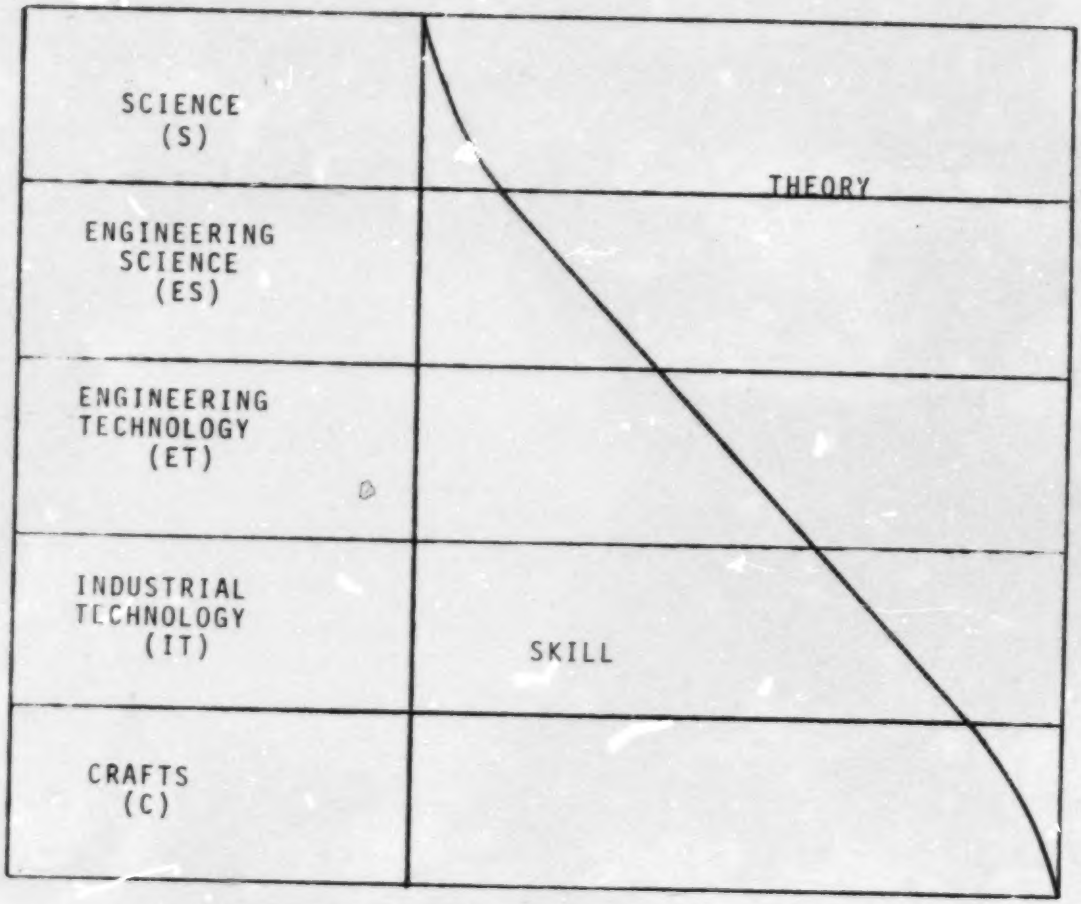
SCIENCE
(S)
ENGINEERING
SCIENCE
(ES)
ENGINEERING
TECHNOLOGY
(ET)
INDUSTRIAL
TECHNOLOGY
(IT)
CRAFTS
(C)
THEORY
SKILL

Figure 3

Technological Personnel Spectrum Map

THEORY - SKILL MIX

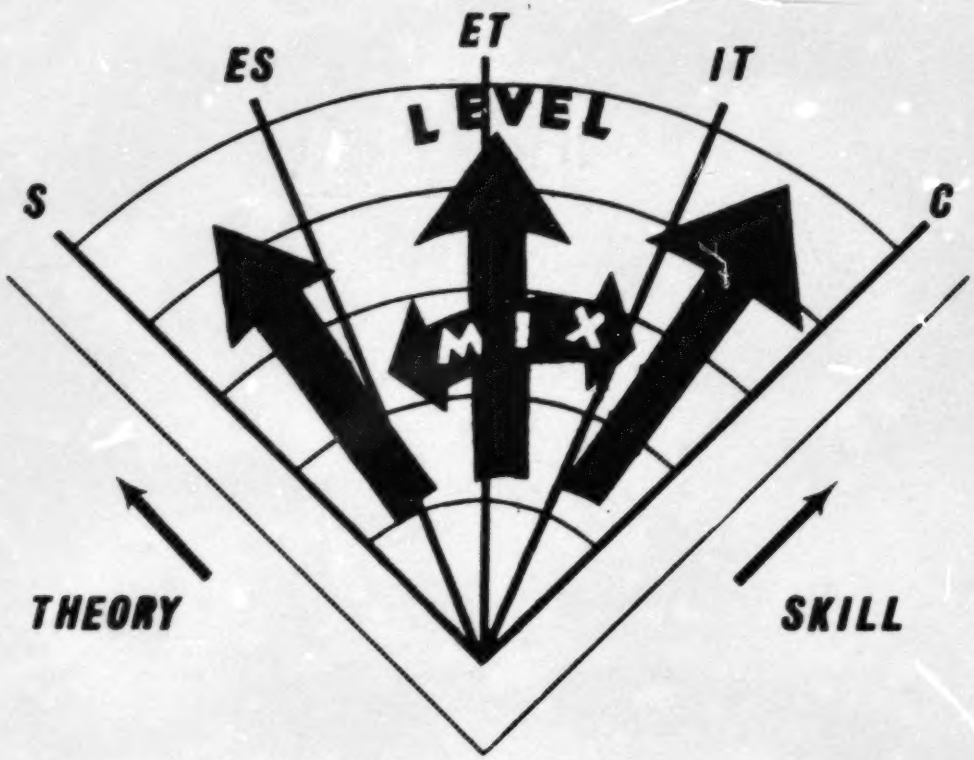

Figure 4

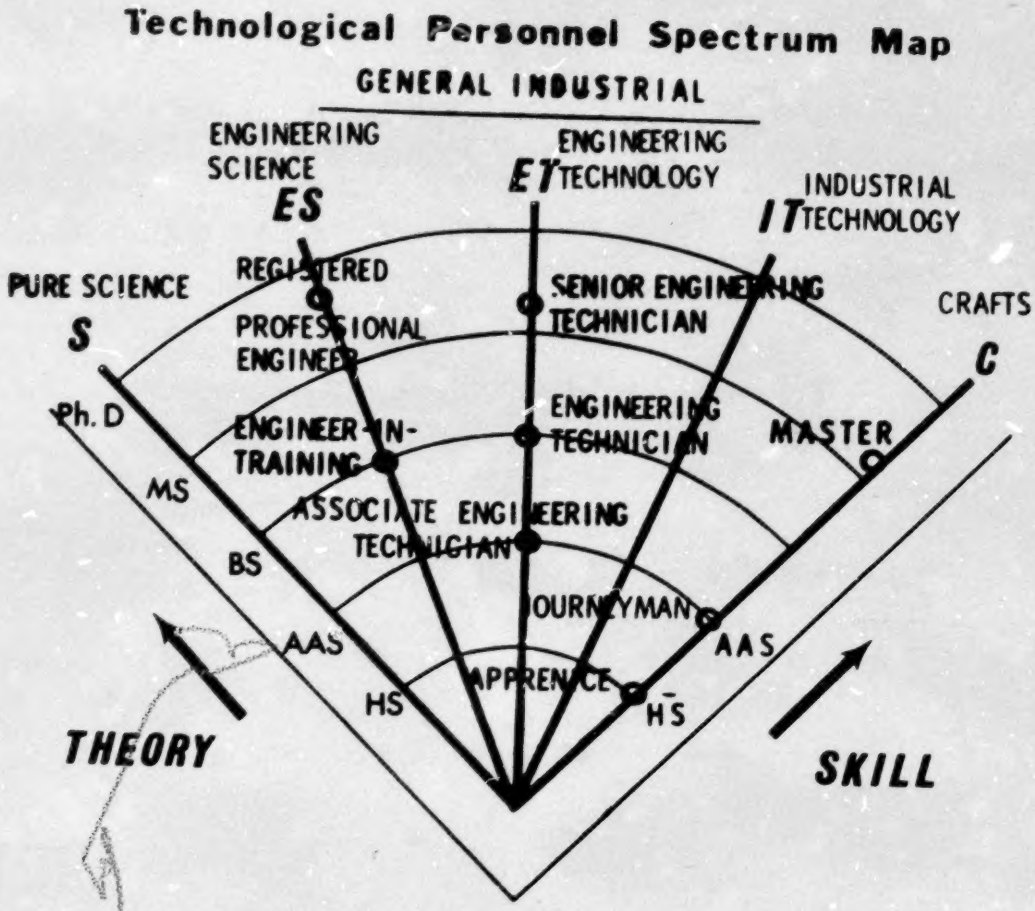
Technological Personnel Spectrum Map
GENERAL INDUSTRIAL
ENGINEERING SCIENCE
ES
ENGINEERING TECHNOLOGY
ET
INDUSTRIAL TECHNOLOGY
IT
PURE SCIENCE
S
CRAFTS
C
REGISTERED PROFESSIONAL ENGINEER
SENIOR ENGINEERING TECHNICIAN
Ph. D
ENGINEER-IN-TRAINING
ENGINEERING TECHNICIAN
MASTER
MS
ASSOCIATE ENGINEERING TECHNICIAN
BS
JOURNEYMAN
AAS
AAS
APPRENTICE
HS
HS
THEORY
SKILL

Figure 5

Technological Personnel Spectrum Map

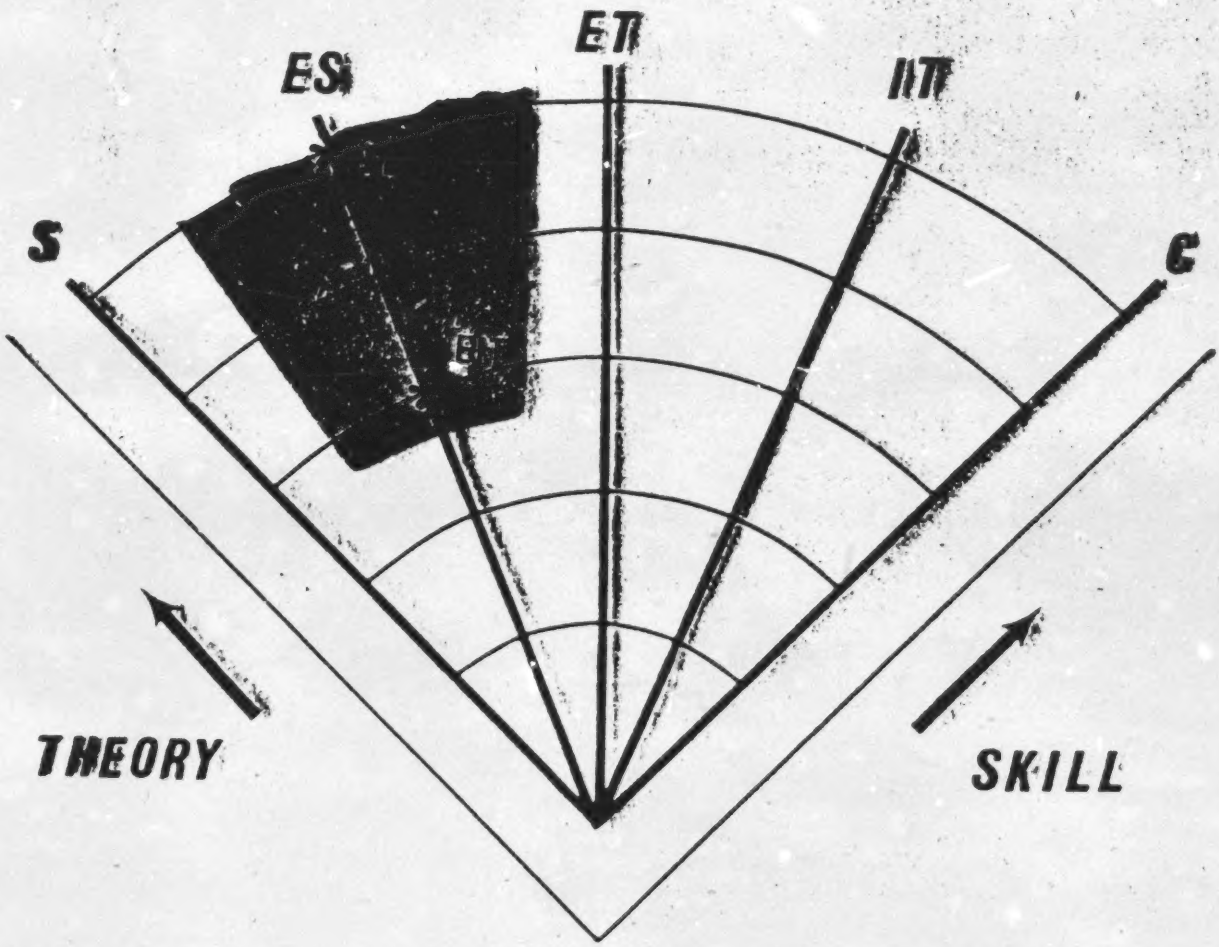

Figure 6

Technological Personnel Spectrum Map

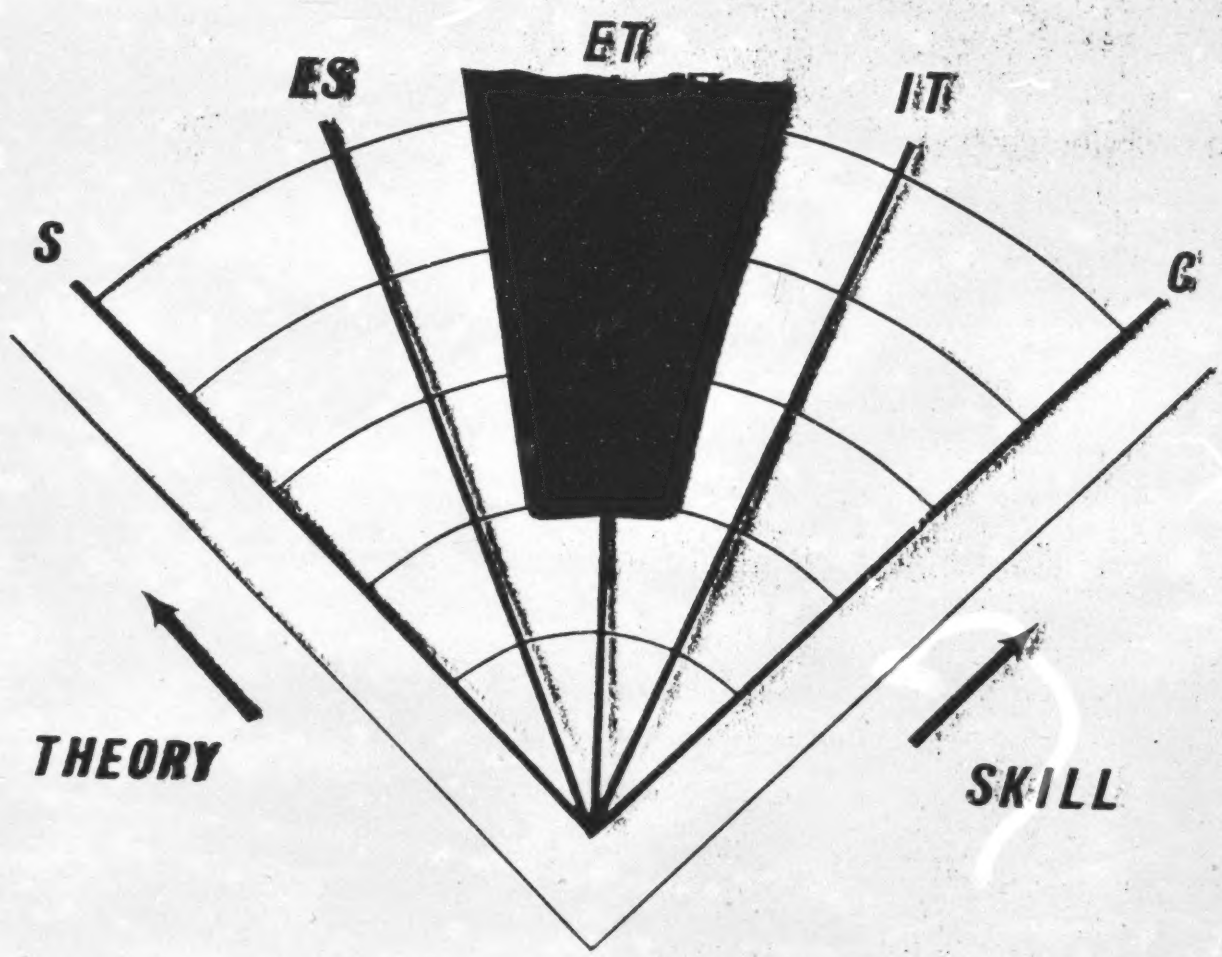

Figure 7

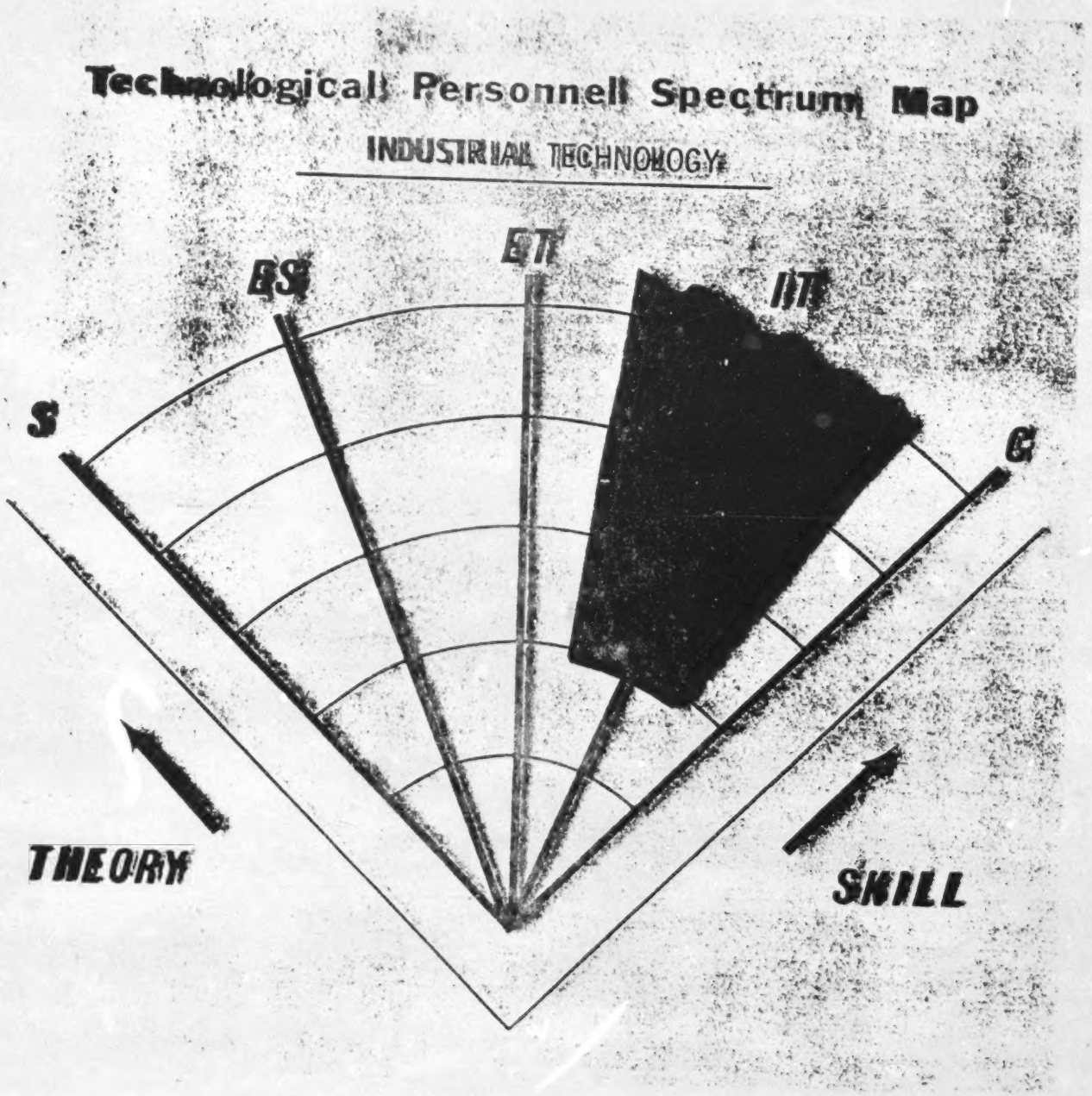
Technological Personnell Spectrum Map
INDUSTRIAL TECHNOLOGY
ES
ET
IT
S
C
THEORY
SKILL

Figure 8

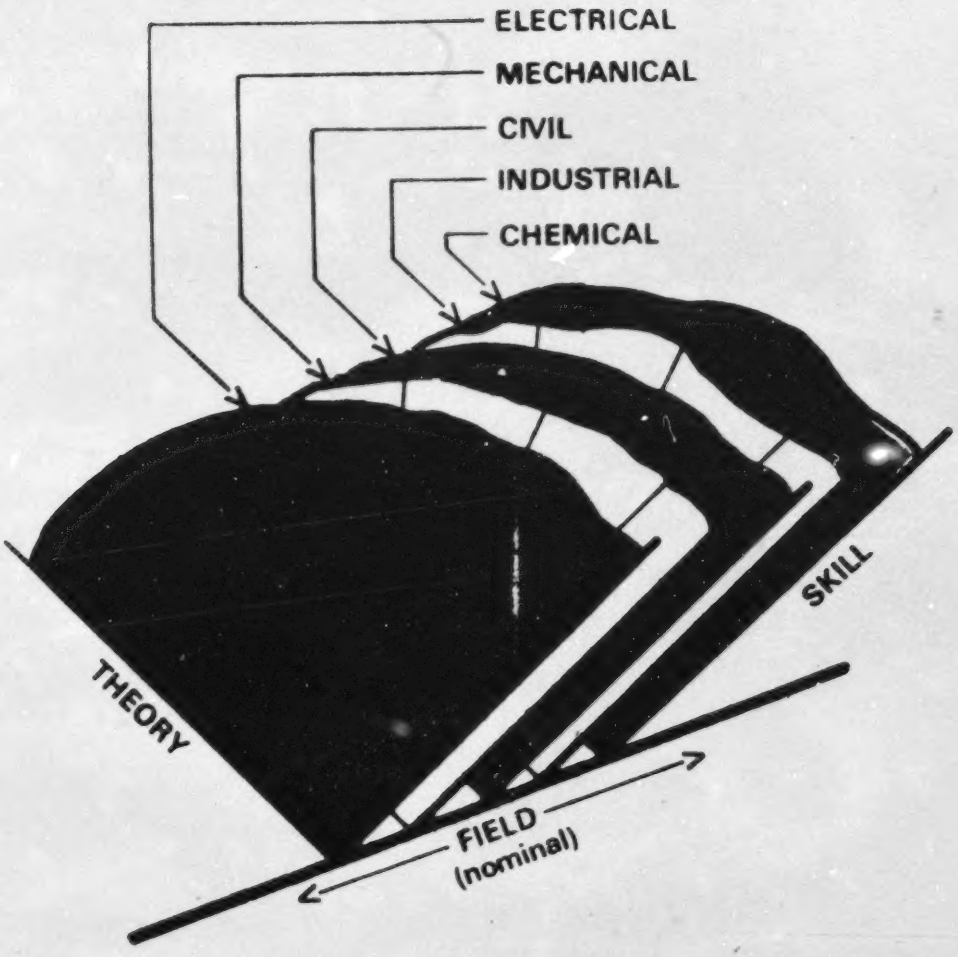
ELECTRICAL
MECHANICAL
CIVIL
INDUSTRIAL
CHEMICAL
THEORY
SKILL
FIELD
(nominal)

Figure 9

Technological Personnel Spectrum Map

RESEARCH ORENTIATED FIRM

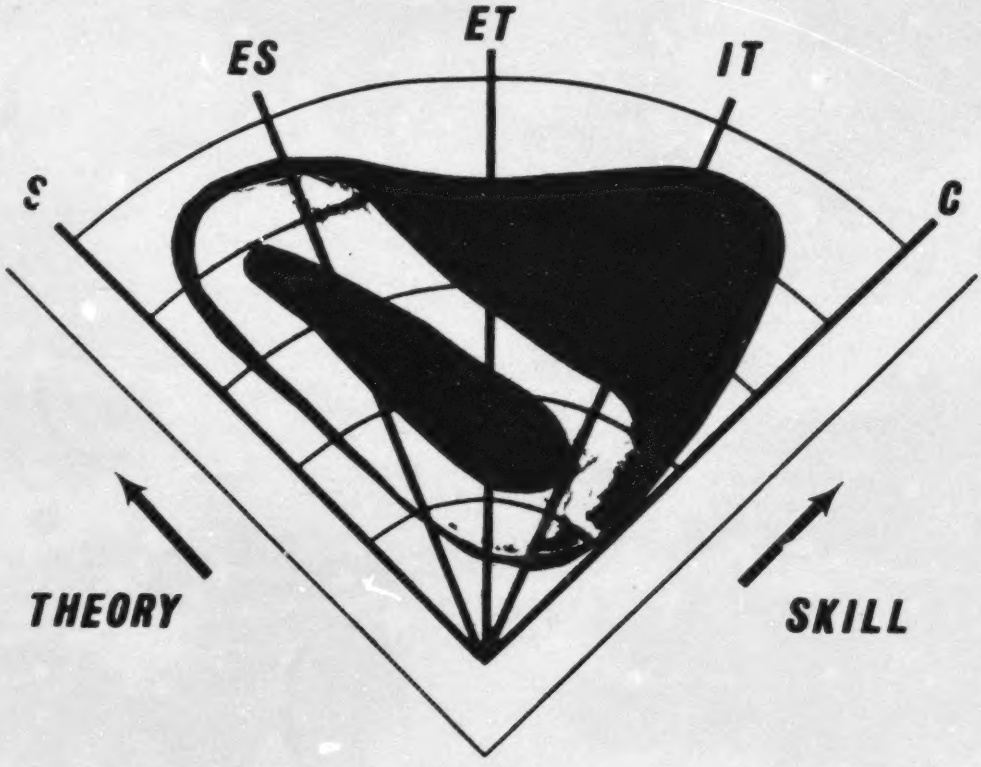

Figure 10

Technological Personnel Spectrum Map

PRODUCTION ORENTIATED FIRM

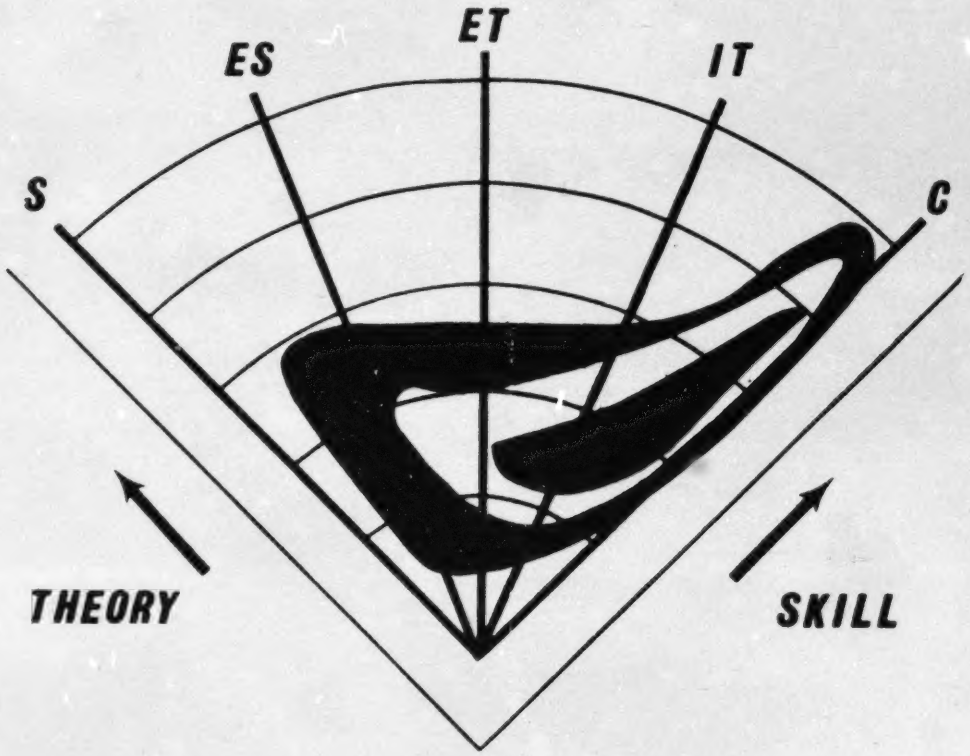

Figure 11